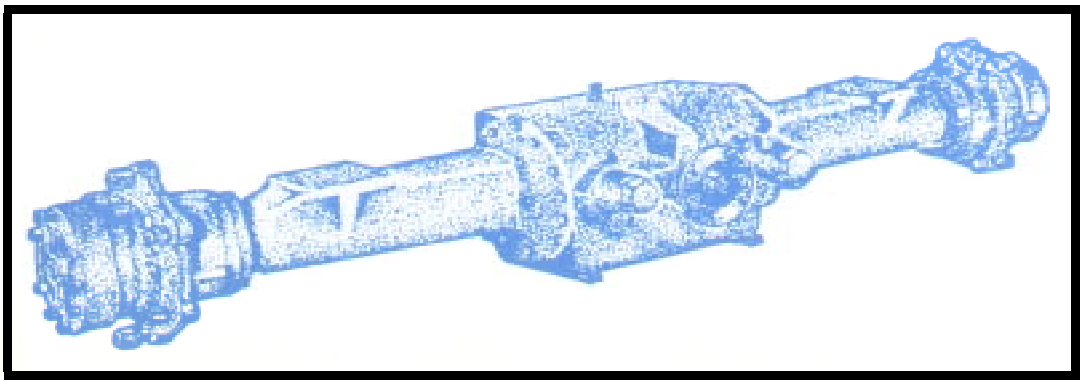
WINGET

Hamworthy

HAMWORTHY TRANSMISSIONS DIVISION

RIGID AXLE TYPE 1000



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INTRODUCTION

This Service Manual applicable to the Hamworthy 1000 Series Rigid Drive Axle is a re-print of the manual last published in 1978.

The procedures described within this manual should enable experienced service personnel to strip, repair and re-build the Hamworthy 1000 Series Axle fitted to some early models of Winget Site Dumpers and Masted Forklift Trucks in a safe and competent manner. The procedures are not intended to be used by personnel who are unfamiliar with the product or mechanically inexperienced.

It is assumed that personnel are aware of the Health & Safety Regulations, which should be applied but the following should act as a reminder. This is not an exhaustive list.

Whenever possible any repairs or service should be carried out in a clean environment. If work must be carried out on site or in the field steps should be taken to ensure that dirt or foreign materials cannot enter the assembly.

Ensure all tools are in good condition and only use the correct tool for the job in hand,

Always wear safety spectacles or goggles when using soft or hard-faced hammers, chisels drifts or when using air tools. Wear safety spectacles when cleaning components or when grinding.

Do not misuse airlines and be aware of the damage compressed air can cause if misused.

Always ensure lifting equipment is in good condition and the Safe Working Load (S.W.L.) exceeds the weight of the component to be lifted.

Always use suitable supports i.e. axle stands or baulks of timber in conjunction with hydraulic jacks etc. Never rely on hydraulic jacks alone to support the weight of a machine.

Be aware of hot surface temperatures and take care when draining hot oils. Always dispose of waste oils in accordance with local and national regulations do not allow it to drain onto the ground or dispose of it down drains or watercourses.

Whenever possible always disconnect the battery or battery isolator when working on the equipment to prevent electrical shorts and unauthorised starting.

Refer to the Operators Handbook for a guide to the correct sequence for assembling components and sub-assemblies.

Oils, fuels, silicone sealer etc can cause skin diseases if allowed to contaminate the skin. Always apply barrier creams, wear suitable protective clothing or when contamination is unavoidable clean the area with soap and water as soon as possible. Do not use thinners or other solvents to clean the skin.

Health and Safety is a matter of common sense. If common sense is applied correctly the risk of accidents can be reduced.

The contents of this manual although correct at the time of publication in 1978, may be have been subject to alteration by the manufacturers without notice and Winget Limited can accept no responsibility for any errors or omissions contained within the following pages. Nor can we accept any liability whatsoever arising from the use of this manual howsoever caused.

Winget Limited operate a policy of continuous product development. Therefore, some illustrations or text within this publication may differ from your machine.

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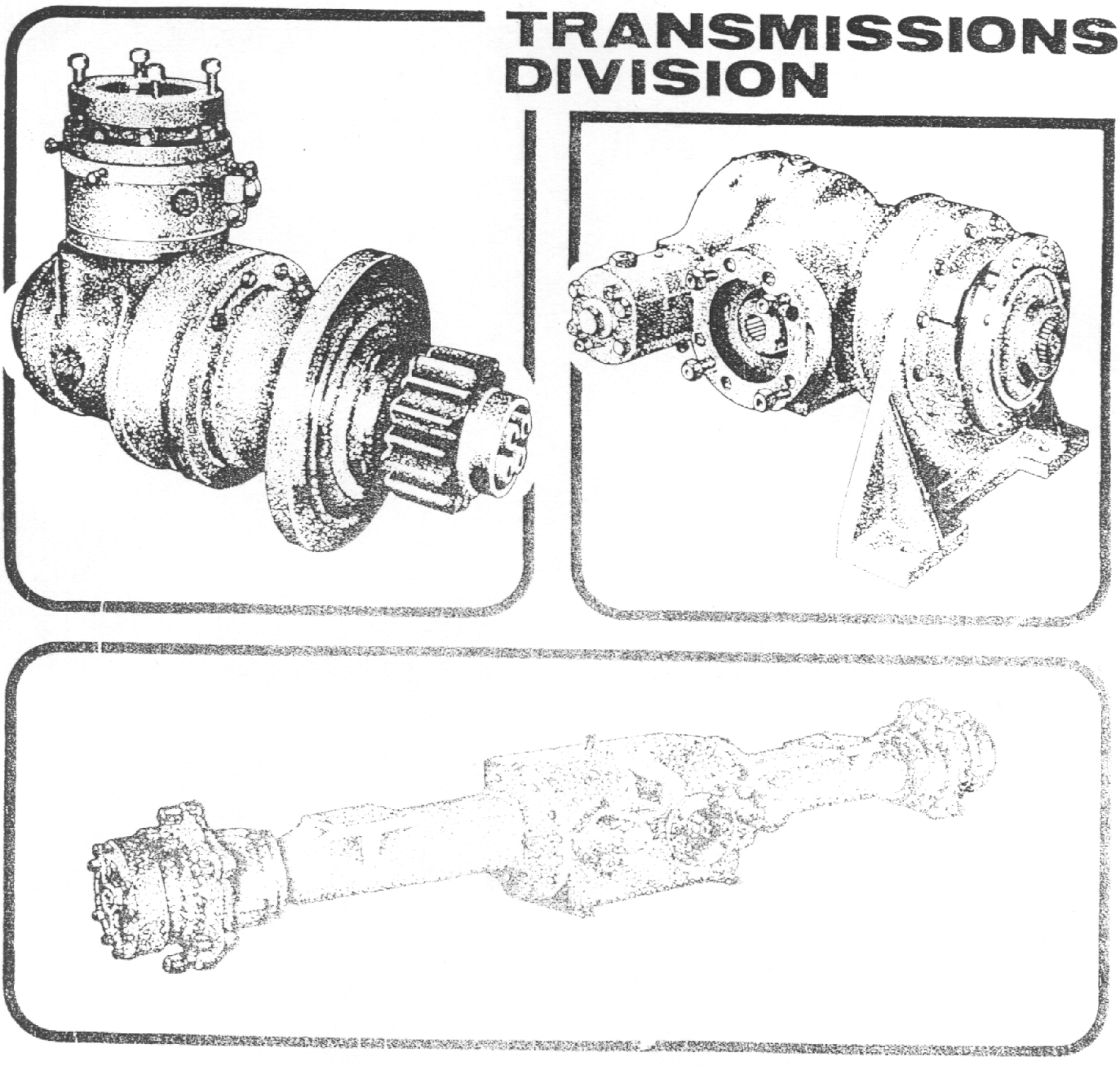
Hamworthy

APRIL 1978

HAMWORTHY TRANSMISSIONS DIVISION

RIGID AXLE TYPE 1000



Hamworthy

SERVICE MANUAL

RIGID DRIVE AXLE TYPE 1000

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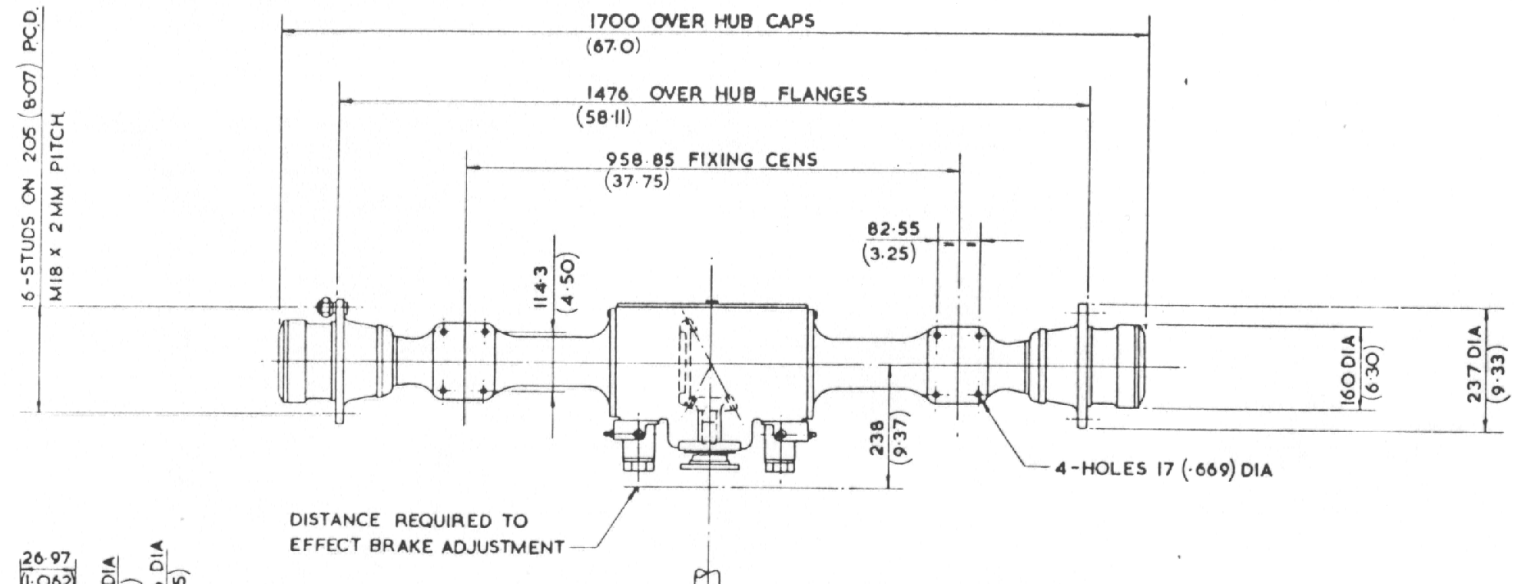

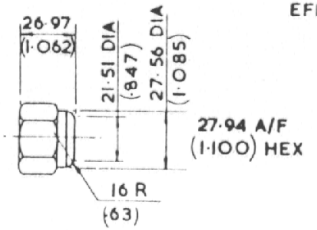

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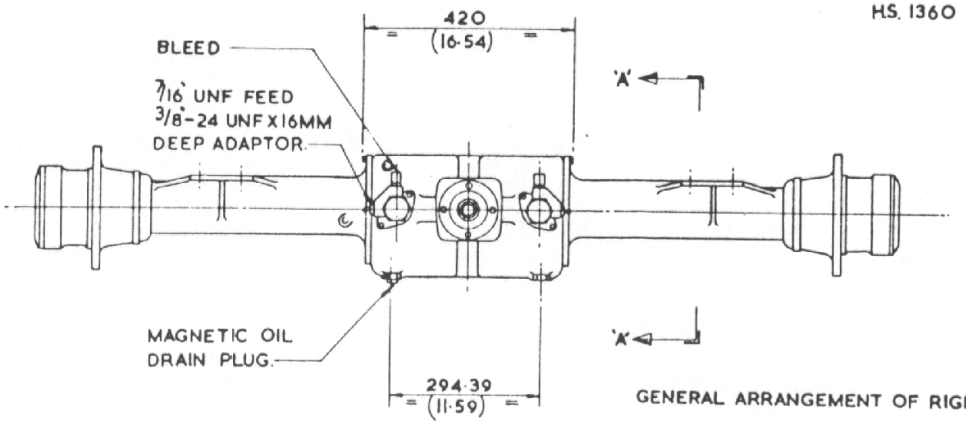

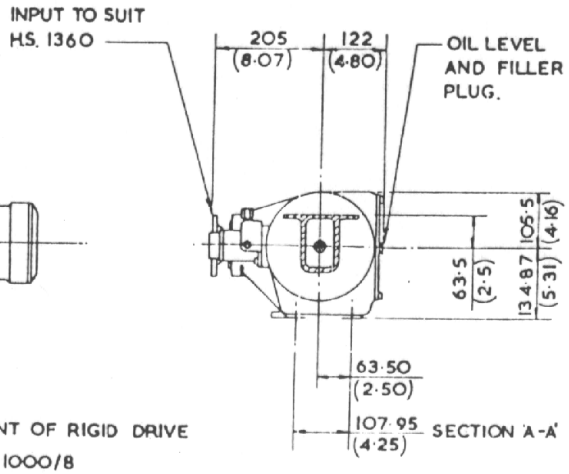

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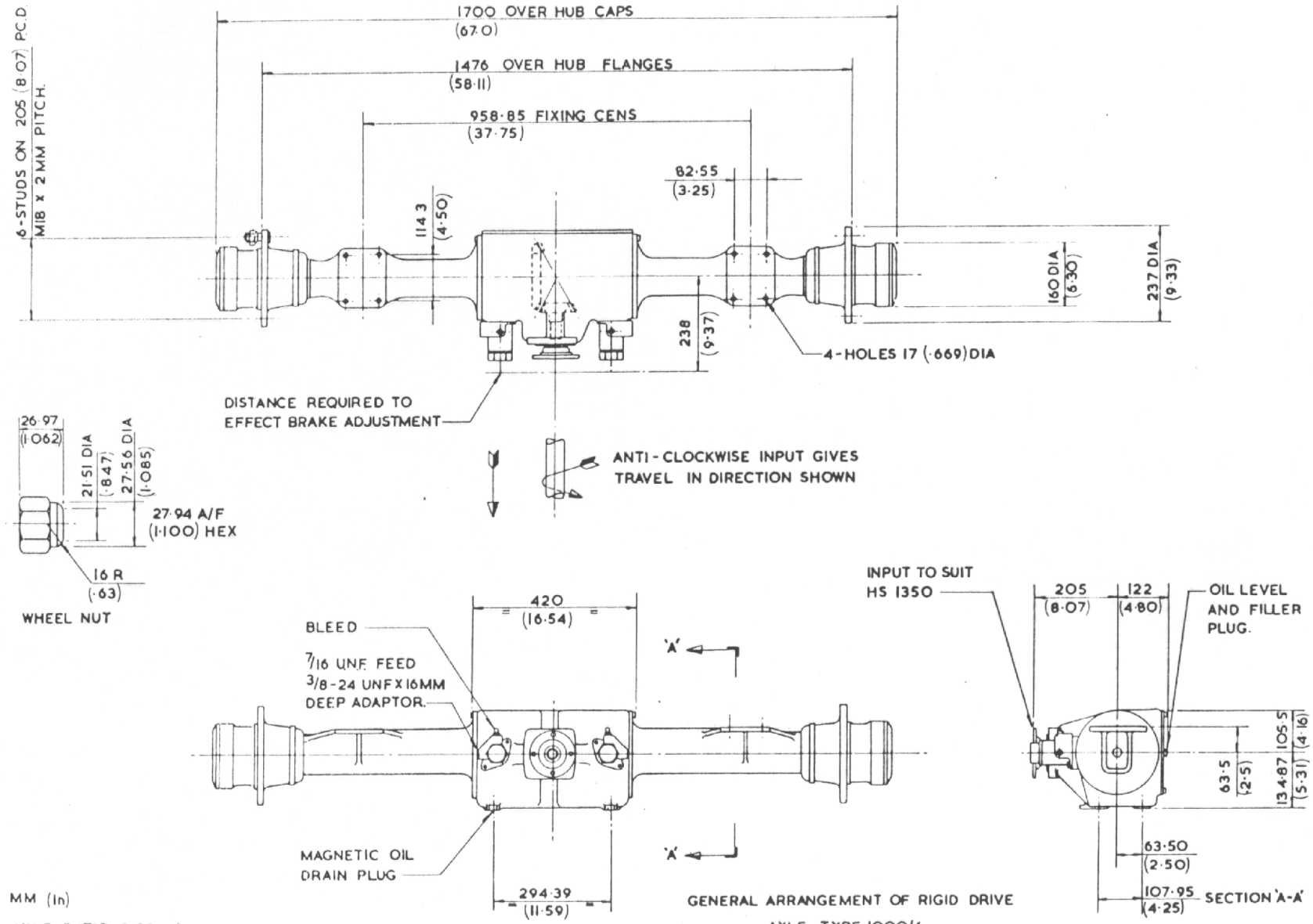
GENERAL ARRANGEMENT OF RIGID DRIVE
AXLE TYPE 1000/8



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GENERAL ARRANGEMENT OF RIGID DRIVE
AXLE TYPE 1000/6

INTRODUCTION

The Hamworthy type 1000R rigid drive axle is of the double reduction type, having primary reduction by spiral bevels and secondary reduction through planetary gears in the hub ends.

GENERAL DESCRIPTION

Axle Casing and Mounting Arms

The axle casing and mounting arms are manufactured from separate S.G. Iron castings, spigotted and bolted together. In this way the axle width may be varied whilst still retaining the standard centre casing.

Differential

The differential is of the two bevel pinion type with the exception of some early axles which may be fitted with four pinions. Both the spiral bevel wheel and pinion are mounted on taper bearings. Drive is transmitted from the spiral bevel wheel via the pinions through the drive shafts and the planetary hub gears.

Hub Assemblies

The hub gears are three pinion epicyclic spur type mounted on bush type bearings in the early design and needle roller bearings in the later design axles. The gears run in the annulus gear which is bolted and dowelled to the axle arm.

The hubs run on high capacity, long life taper roller bearings. Face type hub oil seals are fitted and are designed to eliminate the oil sealing problems usually associated with lip type seals.

Brake Assemblies

The brake assemblies are oil immersed multi-plate disc type mounted within the centre casing and are operated hydraulically. As they are enclosed and running in oil they are free from the ingress of dirt and foreign matter, and are thus ideally suited to off-highway applications. The centre casing has been designed to give adequate oil capacity for heat dissipation.

For ease of servicing both the sintered bronze brake plates (which are splined to the drive shafts) and their mating steel plates can be removed through an access hole in the centre casing after partial removal of the drive shaft, and extraction of the torque pin as described in the Brake Dismantling Section.

Differential

Only a high quality Hypoid E.P. mineral oil (containing limited slip and anti-squawk additives for the brake plates) of the following viscosity must be used:

S.A.E.80. For ambient temperatures between minus 10°C. (15°F) and 30°C. (90°F).

S.A.E.75. For ambient temperatures between minus 25°C. (−15°F) and minus 10°C. (15°F).

See Lubrication Chart for details of the various grades recommended.

Oil is entered through the combined filler and level plug (94) situated in the axle casing cover (2), a magnetic drain plug being situated at the bottom.

After the first 200 hours running drain the oil while the axle is warm and refill with fresh oil. Allow a few moments for the oil level to settle.

Top up the oil level after every 50 hours running.

Drain and refill with fresh oil after every 1000 hours running.

Hub Reduction Gears and Hub Bearings

The same oil specified for the differential must be used for the hubs.

To fill, stop the machine so that the combined hub oil filler and level plug (34) is in the correct position at the bottom. Remove plug (34) and charge with oil until it overflows. Allow a few moments for the oil level to settle.

Top up the oil level every 50 hours running.

Drain and refill with fresh oil every 1000 hours running.

Oil Capacities

Hub (one side)	0.57 l. (1 Imp. pint)
Differential	5.7 l. (10 Imp. pints)

RECOMMENDED LUBRICANTS – AXLES WITH OIL IMMERSED MULTI-PLATE BRAKES

OIL COMPANY	AMBIENT TEMPERATURE RANGE	
	From –25°C (–15°F) to –10°C (15°F)	From –10°C (15°F) to 30°C (90°F)
B.P.	B.P. Tractran 9. (Top Up Only)	B.P. Hydraulic TF–8*
CASTROL	Agricastrol MD	Agricastrol AS
DALTONS	No suitable grade available	
DUCKHAMS	No suitable grade available	*Hypoid 90 DL
ESSO	IL 2082	IL 2082
FINA	Agrifina Oil FT*	
GULF	Gulf Universal Tractor Fluid	Gulf Multi-purpose Tractor Oil 20W/30
MOBIL	Mobilube HD 75* OR Mobilfluid 427	Mobilube HD 80* OR Mobilfluid 422
SHELL	*S.7224 (Initial Fill) *Spirax HD 75 (Top Up Only)	Donax T12 (Initial Fill) Spirax EP 80 (Top Up Only)
TEXACO	No suitable grade available	*ETL 2039
WALKERS	Centlube E 76 Compound	Centlube F 76 Compound

NOTE: 1. *All the oils are Extreme Pressure Lubricants containing limited slip and anti-squawk additives for the brake plates. Oils marked * meet the specification MIL–L–2105B. API–GL5 CLASS.*

2. *Should the climatic conditions vary from those listed above, please consult our more detailed Lubrication Book.*

Every 50 Hours

Check tightness of road wheel mounting nuts (46) to the correct tightening torque of 30.42 Kg.m. (220 lb.ft.).

Every 200 Hours

Remove, clean and refit the axle casing breather. Inspect the area around the pinion oil seal housing, planet carriers, hub oil seals and brake cylinders for any oil leakage. If there is any sign of leakage, fit a new oil seal or make good the joint as appropriate.

Every 500 Hours

Check tightness of all external nuts and bolts in accordance with the torque figures given in the following text.

Every 1000 Hours

Check hub bearing adjustment as detailed in Section 4 Assembly – Hubs, Brakes and Differential.

RECOMMENDED TORQUE FIGURES

Item No.	Torque Fig. Kg.m. (lb.ft.)
10	4.7 (34)
37	7.9 (58)
46	30.42 (220)
47	12 (89)
74	2 (15)
78	4.7 (34)
81	4.7 (34)
87	2 (15)

SECTION 4 – HUBS, BRAKES AND DIFFERENTIAL

General

The item numbers in the text refer to components shown on the Sectional Arrangement Drawing and List of Parts at the end of this Section.

The hub and planet gear assembly, brake actuation assembly and brake plates may be removed with the axle still in place, however for convenience and ease in carrying out some of this work it may be an advantage to remove the axle complete from the machine. For servicing the differential components the axle must be removed from the machine.

DISMANTLING

Hubs

1. Remove wheel stud nuts (46) and withdraw road wheel assembly.

2. Remove the magnetic drain plug in axle casing (1) and allow the oil to drain into a suitable receptacle.

3. Remove planet carrier capscrews (37) and spring washers (38).

4. Planet carrier (31) complete with gears (40), pins (35), bushes (43) (early design) or washers (39), needle rollers (42) and spacer (41) (later design) and thrust button (33) may now be withdrawn as an assembly using the 3 – M10 x 1.5 mm. pitch extractor holes in the carrier flange (early design) or by three cast slots in hub (later design). Use Special Tool ST.1015.007 to remove carrier.

5. Should it be necessary to strip the planet carrier assembly proceed as follows:
   Remove three planet pin retaining pins (44). Place the assembly on the bench on its outer face and gently tap out planet pin (35) complete with 'O'-ring (36). Planet gear (40) complete with needle rollers (42), washers (39) and spacer (41) (later design) or bushes (43) (early design) may now be removed.

   Note: Take care not to lose any of the needle rollers.

   Repeat this procedure in the other two positions. If thrust button (33) requires renewing turn over planet carrier (31) and tap out the thrust button with a suitable drift.

6. Unless drive shaft (15) or brake plates (5 and 6) are to be renewed the drive shaft should be left in position as this will keep brake plates (5 and 6) correctly located.

7. Knock back the tabs of lockplate (32) and remove setscrews (47).

   Note: If lockplate (32) was not originally fitted reassemble with a new lockplate (32) and setscrews (47). Consult Spares Manual for ordering instructions.

8. With the aid of the 2 – M10 x 1.5 mm. pitch extractor holes in the annulus flange, withdraw the annulus (28) complete with three dowels (98) and pin (25).

9. Remove bearing spacer (49) complete with shim pack (48).

10. Hold hub (22) square to the axle, then tap off with a soft hammer against the hub flange. This will remove hub (22) complete with bearing cups (21 and 23) and outer bearing cone (24).

    Note: Take care not to let the outer bearing cone (24) drop to the ground as it is pulled away from axle arm (13 or 14).

11. Tap seal housing (17) squarely off mounting arm (13 or 14) to enable removal of seal (18) and, or, bearing cone (20).

12. With a suitable drift tap out bearing cups (21 and 23).

BRAKES

In the event of brake inefficiency carry out the following procedures before dismantling any brake components: First remove level plug (94) and magnetic drain plug and drain the oil.

Brake Adjustment

Check the brake adjustment for correct setting as follows:

1. Unscrew and remove brake cylinder cap (57) complete with spring (58).
2. Remove locknut (60).
3. Fully tighten pull rod nut (59) then screw back one and a half complete turns. Check that the hubs (22) can still be turned freely.
4. Secure nut (59) in position with locknut (60).
5. Fit spring (58).
6. Apply sealing compound to the face of cylinder cap (57) and screw into cylinder (56).

If brake efficiency is still not correct check cylinder seals.

Cylinder Seals

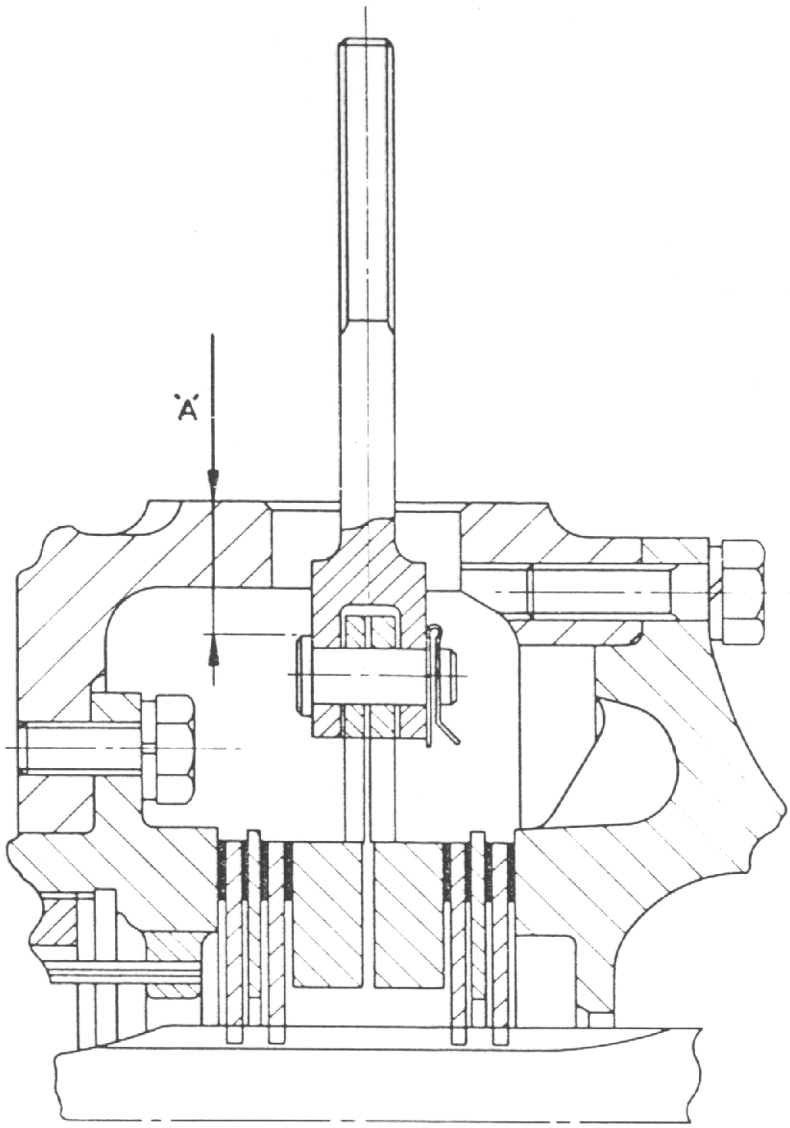
Jack up the machine and run the axle. Apply brakes and check that both sides operate. If one side fails to operate this could be due to faulty seals (54 or 55). To rectify proceed as follows:

1. Carry out procedures detailed in Brake Adjustment paragraphs 1 and 2.
2. Unscrew nut (59).
3. Withdraw piston (61) with seal (55).
4. Remove spacer (62) and inner seal (54).
5. Replace defective components.
6. Reassemble components as detailed on page 4/10 Assembly – Cylinder Seals.

Brake Plates

To determine the extent of wear of brake plates (5 and 6) proceed as follows:

1. Disconnect brake pipe connections.
2. Unscrew and remove brake cylinder cap (57) complete with spring (58).
3. Unscrew and remove locknut (60) and nut (59).
4. Unscrew and withdraw setscrews (74) complete with spring washers (75). Remove brake cylinder (56).
5. Pull brake rod (52) outwards and at the same time measure the dimension from the brake cylinder boss to the head of link pin (50). See Illustration.



CHECKING BRAKE PLATE WEAR

A. Dimension taken from face of brake cylinder boss to head of link pin.

6. If dimension 'A' approaches the maximum of 24 mm. (0.95 in.) brake plates (5 and 6) are worn out. New plates must be fitted as detailed under Assembly – Brake Plates.

Remove the worn brake plates as follows:

1. Withdraw drive shaft (15) as detailed in the preceding Hub Section.
2. Remove setscrews (87) and washers (88 and 9) and axle casing cover (2).
3. Remove retaining pin (3) and cover (12) if fitted and tap out torque pin (4) complete with 'O'-ring (11) if fitted.
4. Remove brake plates (5 and 6).
5. Replace defective components and assemble as detailed under Assembly – Brake Plates.

Differential

NOTE: The differential may be dismantled if necessary, by carrying out the operations 1 to 3 inclusive in the preceding Hub Section and, after draining the differential oil, both operations in the preceding Brake Section under heading Brake Plates numbered 1 to 4.

Spiral Bevel Wheel and Cage

1. Support the outer end of mounting arm (13/14) then remove setscrews (10), washers (9).

2. With the aid of the 2 – M10 x 1.5 mm. pitch extractor holes in the flange, withdraw arm (13/14).

3. Remove setscrews (78) and spring washers (79) and withdraw differential bearing housing (84) complete with adjusting nut (83), bearing cup (85) and pin (82) (both sides) supporting the differential cages and spiral bevel wheel (77).

4. Spiral bevel wheel (77) with differential cages (90 and 97), bearing cones (86) and differential centre gears may now be removed. Take note on which side wheel (77) is installed to aid re-assembly.

To dismantle the assembly proceed as follows:

1. Position the assembly on the bench with bossed cage (97) uppermost.

2. Remove nuts (81) and tap out bolts (80).

3. Separate differential cages (90 and 97) to enable removal of the differential centre gears. For two pinion differentials first remove spiral bevel wheel (77). With a pin punch remove pin (91).

4. To remove the wheel (77) tap off the bearing cone (86) then with a soft hammer tap the wheel (77) off the cage register.

Pinion

1. Remove coupling flange nut (66) and washer (65). Hold flange with Special Spanner ST.1015.004.

2. Whilst supporting pinion (76) use a soft hammer to tap the pinion from the threaded end into the casing. Inner bearing cone (73) will come away with it.

3. Remove coupling flange (64).

4. Remove spacer (70) and discard. A new spacer must be fitted on assembly if it is of the collapsible type. Retain spacer if it is fitted with shims (69).

5. Remove oil seal (63) to allow removal of outer bearing cone (68).

6. If the bearings are to be renewed tap cups (67 and 72) out of casing (1) with the aid of a suitable drift. Take care to maintain the thickness of shims (71) behind the inner bearing cup to aid re-assembly. Also remove inner bearing cone (73) from the pinion.

7. Remove the axle casing breather.

CLEANING AND INSPECTION

Thoroughly clean all components in kerosene, gasolene or a suitable solvent prior to inspection. All used 'O'-rings, oil seals, Dowty and thrust washers, lock washers and self-locking nuts should be discarded and new ones fitted on re-assembly. Remove any traces of jointing compound from all joint faces.

Examine all components for cracks, corrosion, wear, distortion or any other damage and renew any part found defective. Pay particular attention to the teeth of the annulus, planet gears, sun gear at the end of the drive shaft, spiral bevel wheel and pinion, differential centre gears and to the trunnion arms, bearings, brake plates and brake actuator.

ASSEMBLY

Pinion

1. Tap inner and outer bearing cups (67 and 72) evenly into the bore of casing (1) with the initial thickness of shims (71) between the inner cup and casing.

2. If removed tap inner bearing cone (73) onto pinion (76).

3. Position the pinion and bearing cone in axle casing (1).

4. Place casing (1) onto the face of cover (2) and tap into position outer bearing cone (68).

5. Position coupling flange (64) on the pinion splines and tap into position.

6. Fit washer (65) and old nut (66). Lightly tighten nut whilst holding flange (64) with Special Spanner ST.1015.004.

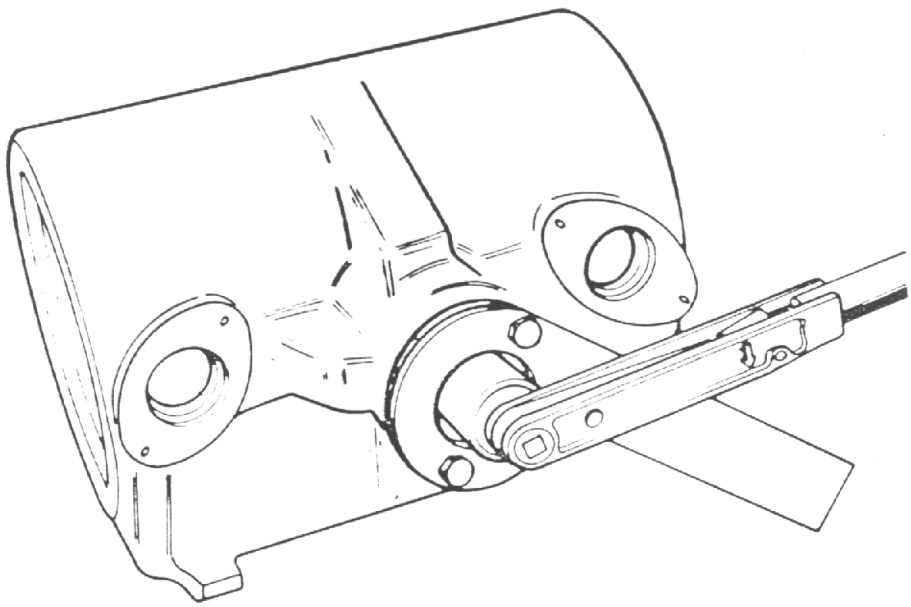
   NOTE: The pinion must be rotated frequently whilst nut is being tightened.

7. Press differential cage bearing cones onto setting gauge ST.1015.001. Position setting gauge in axle casing (1) and place in position differential bearing housings (84) complete with bearing cups (85).

   NOTE: Locking pin (82) must be removed.

8. Clamp bearing housings (84) to axle casing (1) with setscrews (78) and spring washers (79).

9. Tighten adjusting nut (83) to eliminate end float in bearings.



COUPLING FLANGE HOLDING SPANNER

10. Check the gap between the gauge journal and the end face of pinion (76). The gap should be 0.641 mm. (0.025 in.) plus or minus the figure etched on the pinion, i.e. if the etched figure is minus 0.13 mm. (0.005 in.) the gap must be 0.628 mm. (0.020 in.). If the gap is too large add the equivalent thickness of shims (71) behind the inner bearing cup (72). Conversely, if the gap is too small the equivalent thickness of shims (71) must be removed. This requires the differential assembly to be dismantled as described earlier in the text. If a setting gauge is not available fit the initial thickness of shims (71) and refer to the tooth contact diagram for adjustment procedure.

11. Remove bearing housing setscrews (78) and spring washers (79). Remove bearing housings complete with adjusting nuts (83) and bearing cups (85).

12. Withdraw setting tool ST.1015.001 and remove bearing cones (86).

Spiral Bevel Wheel and Cage

1. Refit spiral bevel wheel (77) onto differential cage (90) (4 pinion differential only).

2. Fit bearing cones (86) to differential cages (90 and 97).

3. Place wheel (77) and cage on the bench on the cage end face.

4. Position a new thrust washer (96) if applicable in the cage bore.

5. Fit one of the bevel wheels (95).

6. Position the trunnion (93) complete with bevel pinions (92) onto bevel wheel (95).

7. Fit the remaining bevel wheel (95) complete with washer (96) if applicable into mesh with pinions (92).

8. Position the differential cage (97) making sure that the mating marks line up.

9. Align the holes in differential cage (90) and trunnion (93). Secure trunnion with retaining pin (91) (2 pinion differential only).

10. Refit spiral bevel wheel (77) onto the differential cage (90) (2 pinion differential only). Fit bolts (80) and nuts (81). Torque load nuts to 4.7 kg.m. (34 lb.ft.).

11. Support spiral bevel wheel (77) and differential cages (90 and 97) in axle casing (1), ensuring the wheel is at the correct side (see Installation Drawing).

12. Fit differential bearing housings (84) into axle casing (1) and secure with spring washers (79) and setscrews (78). Ensure that bearing adjusting nuts (83) are free before torque loading to 4.7 kg.m. (34 lb.ft.).

13. Using special spanner ST.1015.002 screw the nuts (83) into contact with the bearing cups (85).

14. With the aid of a dial indicator mounted on the casing, check the spiral bevel wheel (77) run out. This must not exceed 0.1 mm. (0.004 in.). If found to be above this figure the assembly must be removed and the cause found and rectified.

15. Move the dial indicator so that the spindle is in contact and at right angles to one of the teeth on bevel wheel (77) and zero the indicator (See Illustration). The backlash must be a minimum of 0.15 mm. (0.006 in.) and a maximum of 0.20 mm. (0.008 in.) checked with the bevel wheel in three different positions. If the backlash is too high the bevel wheel must be moved further into mesh with the pinion, conversely if the backlash is too low the bevel wheel must be moved further out of mesh. Adjustment of the bevel wheel is obtained by unscrewing the nut (83) on the side the wheel is to be moved towards whilst screwing up the second nut (83) by a similar amount.

Note: Movement of nut is 2 mm. (0.078 in.) for one revolution.

Spiral Bevel Wheel and Pinion Tooth Contact

CORRECT ENGAGEMENT OF SPIRAL BEVEL WHEEL AND PINION. NO ADJUSTMENT REQUIRED. LENGTH OF CONTACT ½ TO ¾ OF TOOTH WIDTH.

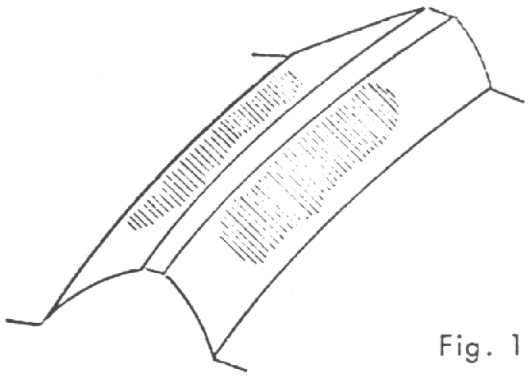


Fig. 1

SPIRAL BEVEL PINION TOO FAR OUT OF MESH, MOVE PINION CLOSER TO WHEEL, IT IS NECESSARY TO INCREASE THICKNESS OF SHIMS (71) AND RE-ADJUST BACKLASH.

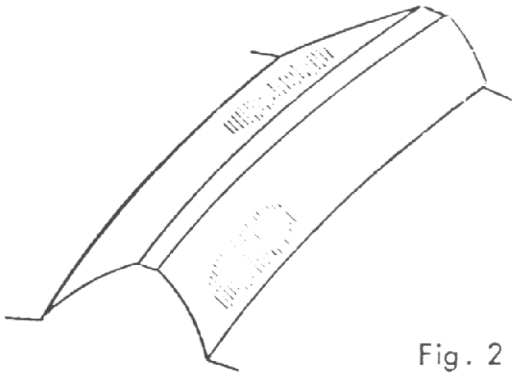


Fig. 2

SPIRAL BEVEL PINION TOO CLOSELY IN MESH, MOVE PINION AWAY FROM WHEEL, IT IS NECESSARY TO DECREASE THICKNESS OF SHIMS (71) AND RE-ADJUST BACKLASH.

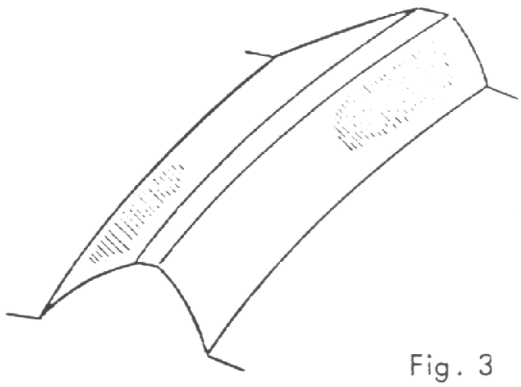
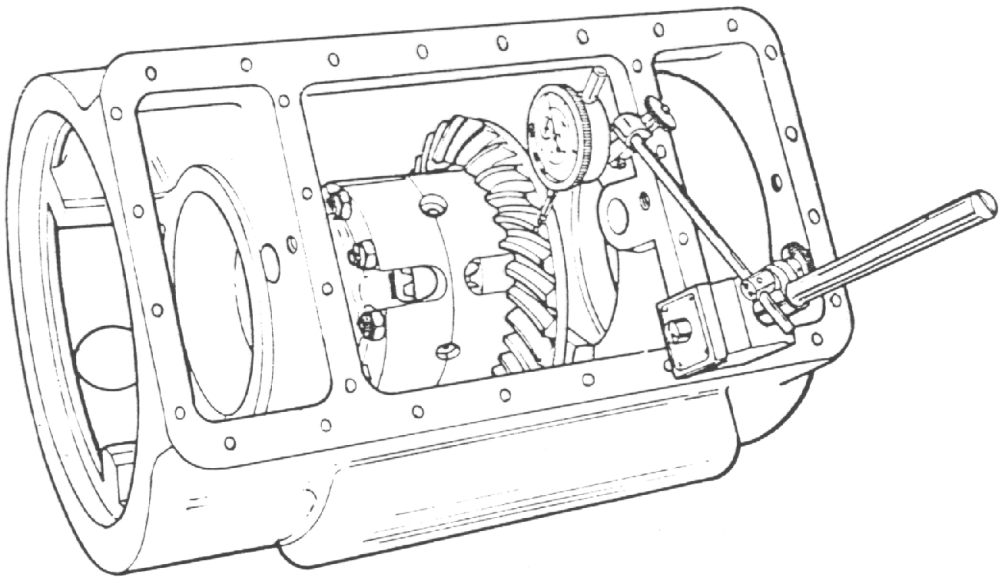


Fig. 3

NOTE

THESE ARE OERLIKON GEARS NOT GLEASON. IT IS IMPORTANT THAT THESE GEARS GIVE THE CORRECT TOOTH CONTACT (SEE FIG. 1) FOR QUIET RUNNING AND LONGER LIFE.



CHECKING SPIRAL BEVEL WHEEL AND PINION BACKLASH

20. Tap bearing cone (68) onto spiral bevel pinion (76).

21. Using a suitable sleeve fit a new oil seal (63). Smear the seal lip with grease.

22. Position coupling flange (64) onto the pinion splines and retain with washer (65) and nut (66). Do not tighten nut at this stage.

23. Clamp special tool ST.1015.004 to the coupling flange (64).

24. Fasten a cord around the journal of coupling flange (64) with the opposite end attached to a spring balance.

25. Tighten nut (66) until spacer (69) is felt to collapse. Take a reading on the spring balance keeping the coupling flange rotating.

    Note: Ignore the initial force required to overcome friction.

    A reading of 3.6 – 4.5 kg. (8 – 10 lb.) is required. If the reading is too low further tighten nut (66).

    Note: If the reading is found to be too high then the spacer (69) must be discarded and the procedure repeated with a new spacer (69).

26. Refit spiral bevel wheel and associated components as previously described ensuring that the correct backlash figure is maintained. After tightening nuts (83), lock with pins (82).

    Note: The following paragraphs 27 – 32 apply to axles fitted with spacer (70) and shims (69).

27. Fit spacer (70) with the initial amount of shims (69) onto the spiral bevel pinion (76) and replace in the casing.

28. Tap bearing cone (68) onto spiral bevel pinion (76).

29. Do not fit oil seal (63) at this stage as this will cause drag.

30. Position coupling flange (64) on the pinion splines and retain with washer (65) and nut (66). Hold flange with Special Spanner ST.1015.004 and torque load nut (66) to 37 kg.m. (275 lb.ft.).

Note: The pinion should be rotated frequently whilst this nut is being tightened.

31. Fasten a piece of cord to the coupling flange, wrap it around the journal with the other end attached to a small spring balance. Ignoring the initial force required to turn the assembly an even pull of 0.45 to 0.91 kg.f. (1 to 2 lbf.) must be registered on the spring balance. If the reading is too low reduce thickness of shims (69) whilst if the reading is too high increase the thickness of shims (69). When correctly set remove the spring balance.

Note: Alter the thickness of shims (69) to correspond with the pinion adjustment shims (71). i.e. if .12 mm. (.005 in.) of shims (71) is added also add .12 mm. (.005 in.) of shims (69).

32. Remove coupling flange (64) as previously described and fit a new oil seal (63) squarely in casing (1) by means of a suitable plate. Lubricate the sealing lip with roller bearing grease.

BRAKES

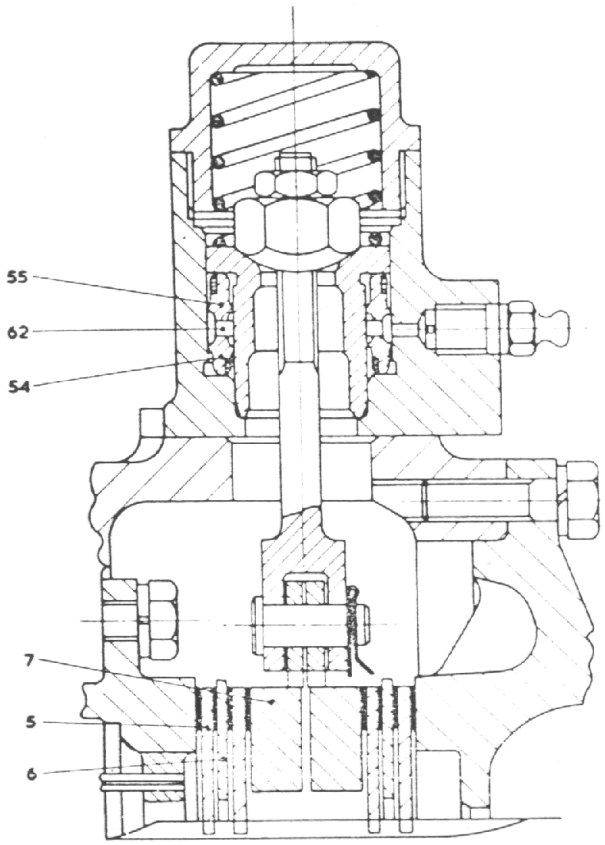
Brake Plates

1. If removed refit pull rod (52) to actuator (7) by means of pin (50) locked in position with circlip (51).

2. Position brake plates (5) and (6) and actuator in the order shown on the arrangement drawing.

3. Fit drive shaft (15) to locate brake plates correctly.

4. Apply sealing compound to the face of brake cylinder (56) and position on axle casing (1) with washers (75) and setscrews (74). Torque load setscrews to 2.3 kg.m. (17 lb.ft.).



CORRECT FITTING OF BRAKE CYLINDER SEALS AND BRAKE PLATES

Cylinder Seals

1. Grease the internal seal (54) and carefully position in brake cylinder bore (56). See Illustration.

2. Fit spacer (62).

3. Grease external seal (55) and carefully position in brake cylinder bore (56).

   Note: Ensure that the sealing lip on each of the seals (54 and 55) is positioned as shown in the illustration.

4. Lightly oil the piston (61), position it in the cylinder bore (56) then carefully push it through the seals (54 and 55) taking great care not to damage the seal lips.

5. Fit the pull rod nut (59).

6. Set brake adjustment as detailed in Section 4 Brake Adjustment on page 4/2 paras. 3 to 8.

Mounting Arms and Casing

1. Apply sealing compound to the face of mounting arm (13/14) and position over drive shaft (15) onto the axle casing (1) making sure that the torque pin hole lines up with the recess in the brake plates.

2. Fit mounting arm washers (9), and setscrews (10). Torque load setscrews to 4.7 kg.m. (34 lb.ft.).

3. Tap torque pin (4) complete with a new 'O'-ring (11) if applicable (lightly oiled) into position.

4. Fit plug (12) if applicable into torque pin hole.

5. Apply jointing compound around the opening of axle casing cover and position cover (2) with washers (88/89) and setscrews (87). Torque load setscrews to 2.3 kg.m. (17 lb.ft.).

6. Refit the magnetic drain plug.

Hubs

1. If removed refit the distance piece (17) onto the mounting arm (13/14) after applying Loctite Plastic Gasket to the mounting arm journal in the area of the distance piece (17). Lightly oil the oil seal recess in the distance piece.

2. If either the hub (22) or bearings (20, 21, 23, 24) have been renewed it will be necessary to re-set the bearing pre-load as the existing shims (48) may not now be suitable. Do not therefore re-fit the oil seal (18) at this stage but proceed to rebuild the hub (22) as follows:

3. Using a suitable plate either press or knock into position the two bearing cups (21 and 23) making sure that they are both fully home.

4. Place the hub (22) on its outer face on the bench and proceed to fit a new set of wheel studs (45).

   Note: The stud heads will be uppermost. Care must be taken that the studs are pressed squarely into the hub flange.

5. Position the inner bearing cone (20) on the mounting arm (13/14).

6. Position the hub assembly square on the mounting arm (13/14) and whilst holding it square tap assembly into position with a soft hammer.

7. Position the outer bearing cone (24) onto mounting arm (13/14), then still holding the hub (22) square, tap the cone fully home.

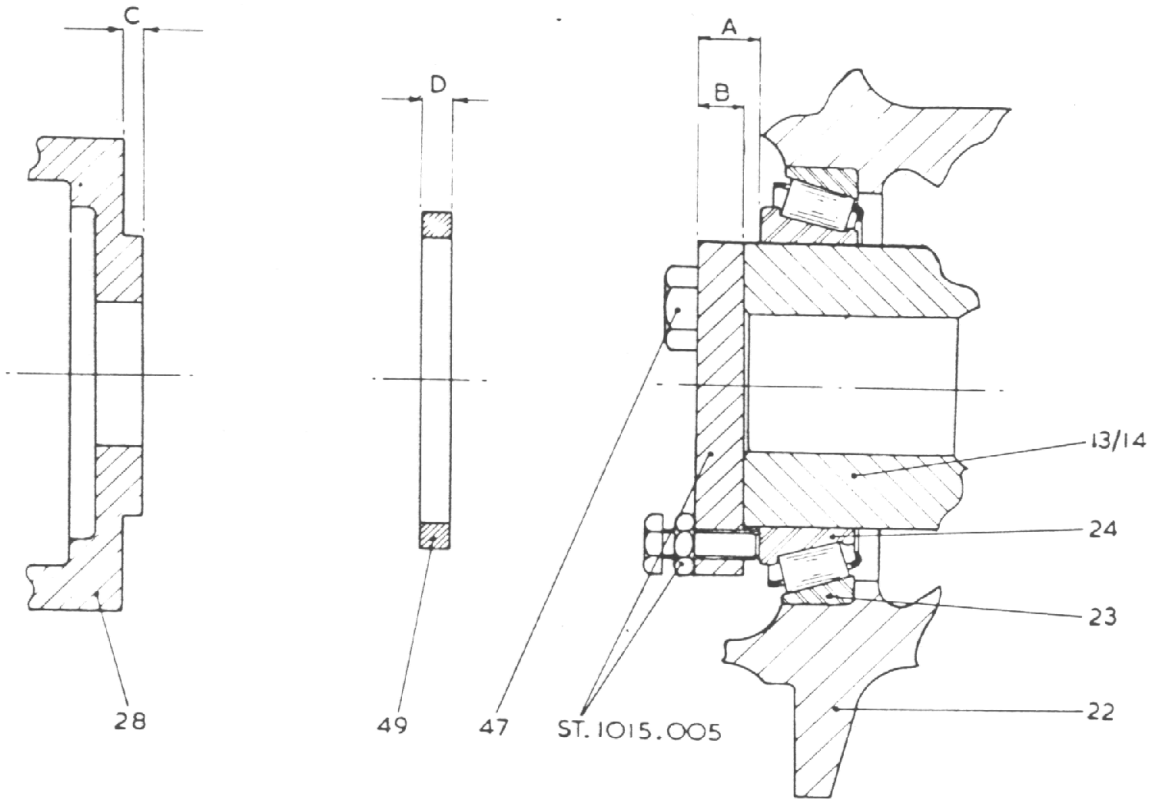
8. Fit special tool ST.1015.005 onto the mounting arm (13/14) securing with old setscrews (47).

9. Lightly and evenly clamp the three setscrews against bearing cone (24).

10. Take readings A, B, C, D as shown in illustration.

11. The shim pack (48) required is determined by the formula:

Shim pack = A – B + C – D + .05 mm. (0.002 in.)



HUB BEARING SETTING

Dimensions A – B + C – D + .05 mm. (.002 in.) = Shims (48) required

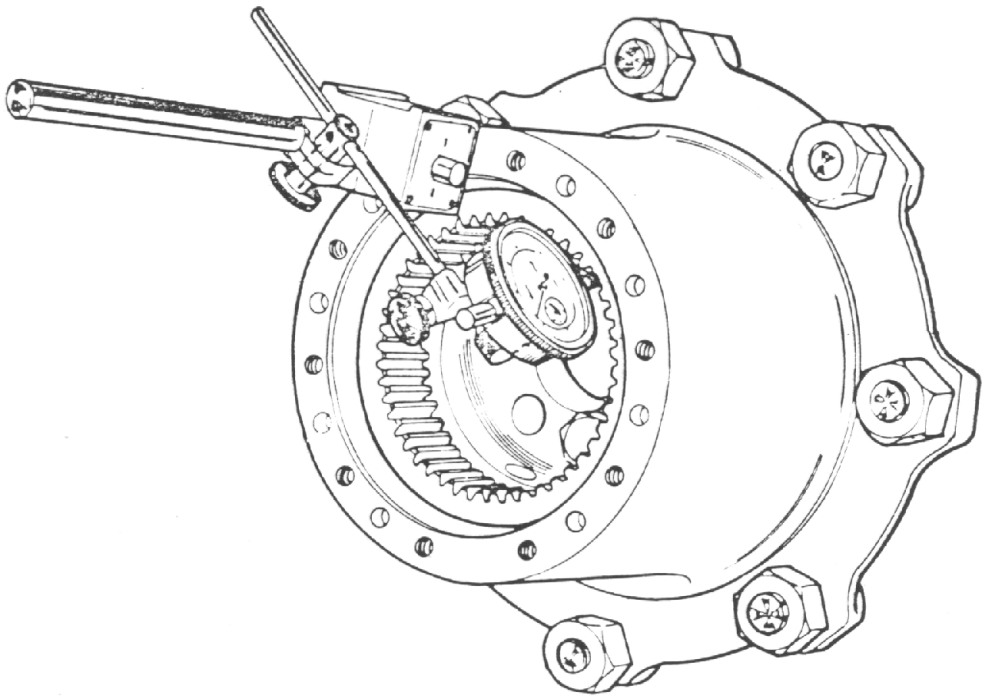
12. Peel off the laminated shims (48) to give the above value.

13. Remove special tool ST.1015.005 and dismantle hub (22) and bearing cones (20) and (24).

14. Fit seal (18) lubricating the 'O'-rings with operating oil. Both surfaces must be absolutely clean and free from contamination.

15. Refit bearing cone (20) followed by hub (22) and outer bearing cone (24).

16. Position shim pack (48) and spacer (49) on the annulus (28) and retain with pin (25).



CHECKING HUB BEARING FOR ZERO END FLOAT

17. Position annulus against mounting arm (13/14). It is important that the three 12 mm. diameter dowel holes are aligned with the mounting arm dowels and not the three larger 12.5 mm. diameter bolt holes. Incorrect fitting could result in the dowels 'working' and causing damage to annulus and mounting arm. Tap 3 dowels fully into position.

18. Fit a new lockplate (32) and secure the annulus with three setscrews (47). Apply Loctite 241 or 245 to the setscrew threads before fitting, ensuring all threads are perfectly clean.

Note: Early designs have setscrews (47) fitted with a Nyloc thread locking insert. Where this is the case discard the original setscrews and fit the later design with no undercut beneath the head and fit also lockplate (32).

19. Torque load setscrews (47) to 12 kg.m. (89 lb.ft.) and bend over tab of lockplate (32).

20. If the hub bearing setting has been carried out correctly hub end float will be zero. This may be checked if necessary by mounting a dial gauge on the hub as illustrated. Rotate the hub at the same time pulling and pushing the hub flange. No variation of the dial gauge needle should be apparent.

Should the planet carrier (31) have been dismantled proceed as follows:

21. Grease the bore of planet gear (40) with roller bearing grease and install two rows of needle rollers (42) each separated by a spacer (41) (later design) or install bushes (43) (early design).

Note: There must be twenty (20) rollers in each row.

Repeat with remaining two gears (40).

22. Smear 'O'-ring (36) with bearing grease and fit to planet pin (35).

23. Place carrier (31) on its outer face on the bench, then if removed fit a new thrust button (33).

24. Position a thrust washer (39) if applicable followed by a gear (40) complete with rollers (42) then another thrust washer (39) if applicable making sure that the washer tabs are located in their respective holes in the carrier (31). Line up the gear (40) and washers (39) if applicable and tap into position the planet pin (35), making sure that the retaining pin hole in the pin (35) is lined up with the corresponding hole in the carrier (31). Fit the retaining pin (44). Repeat in the other two positions.

Note: The planet gears (40) should rotate freely with no signs of any roughness.

25. Apply jointing compound to the planet carrier (31) to hub mating face then offer up the planet carrier assembly to the hub (22), first engaging the bottom planet gear (40) with the annulus gear (28) and teeth of the drive shaft (15). It is then possible to line up the teeth of the remaining two gears (40) by slowly rotating the hub (22). Care should be taken to ensure that the dowel holes in the planet carrier (31) are lined up with the respective holes in the hub (22). Fit three capscrews (37) and washers (38) lightly to maintain alignment.

26. Fit six new dowels (99) with their chamfered end inwards. Tap planet carrier assembly fully into position.

27. Fit remaining capscrews (37) and washers (38). Torque load capscrews to 7.9 kg.m. (58 lb.ft.).

28. Position the hub assembly filler/level plug (34) in its correct position as described earlier in the text then refill with fresh oil of the correct grade as shown in Section 2 – Lubrication.

29. Fit filler/level plug (34).

30. Remove the filler/level plug (94) and refill with fresh oil of the correct grade as shown in Section 2 – Lubrication.

31. Fit filler/level plug (94).

32. Fit road wheel nuts (46). Torque nuts to 30.42 kg.m. (220 lb.ft.).

33. If removed refit the axle to the chassis and re-connect brakes and coupling flange.

Special Tools

Pinion Setting Gauge	ST.1015.001
Differential Bearing Adjusting Nut Spanner	ST.1015.003
Pinion Flange Holding Spanner	ST.1015.004
Hub Bearing Setting Tool	ST.1015.005
Pinion Oil Seal Fitting Tool	ST.1015.006
Planet Carrier Extractor	ST.1015.007

Spare Parts

When ordering spare parts or in any correspondence relating to the axle, the number stamped on the axle nameplate must be quoted. Also give the Item Number and full Description as specified in the LIST OF PARTS.

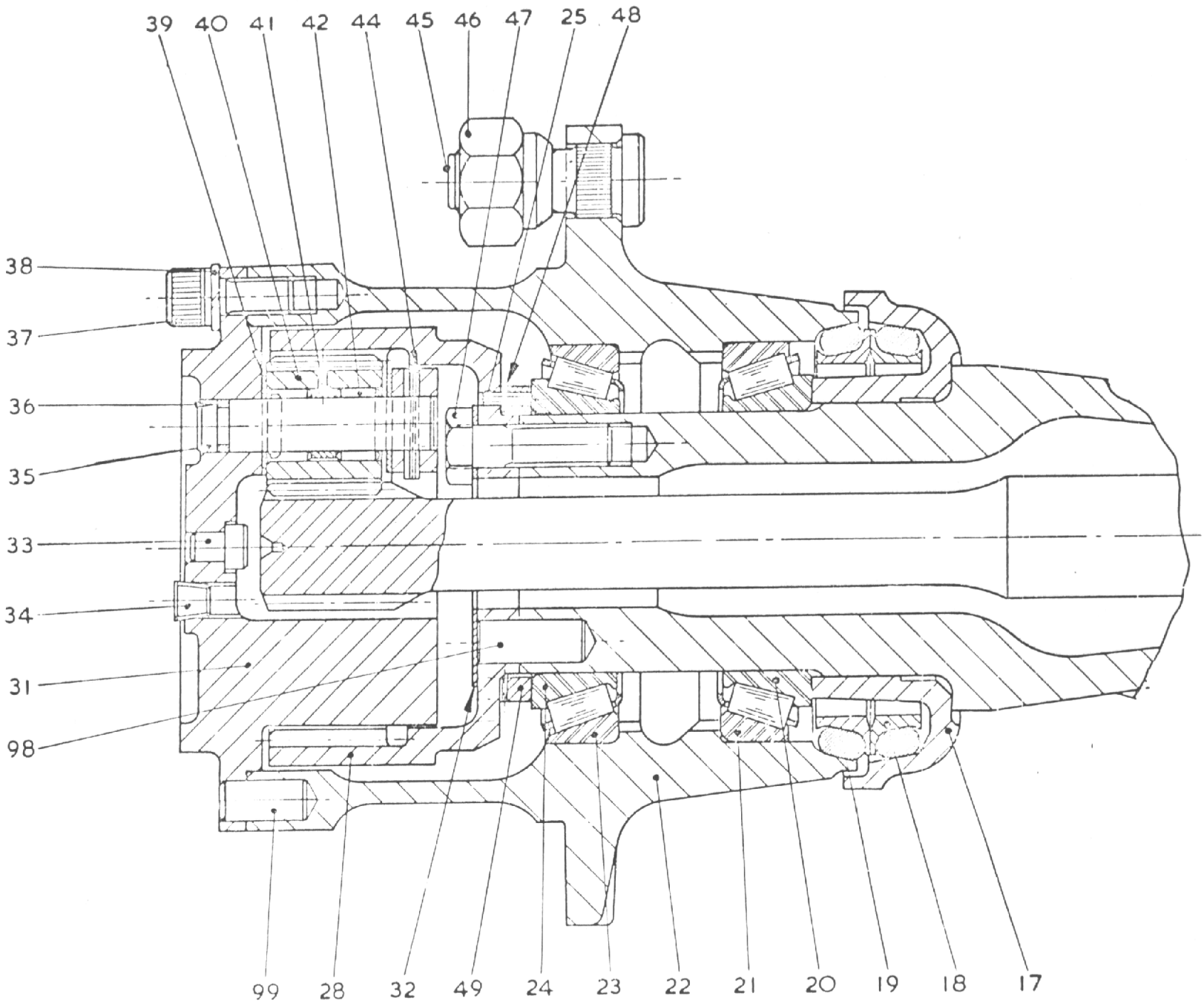
LIST OF PARTS R1000 HUBS, BRAKES & DIFFERENTIAL

Item No.	Description	Qty.
1	Casing – Axle	
2	Cover : 1	1
3	Pin – retaining : 4	1
4	Pin – torque	2
5	Plate – middle	2
6	Plate – intermediate	8
7	Actuator	4
8	Not Applicable	2
9	Washer – spring	
10	Bolt : 13 : 14	28
11	'O'-ring : 4	28
12	Cover : 4	2
13	Arm – mounting – R.H.	2
14	Arm – mounting – L.H.	1
15	Shaft – drive	1
16	Not Applicable	2
17	Piece – distance : 18	
18	Seal – oil	2
19	'O'-ring (SPARES ONLY)	2
20	Cone – bearing : 21	4
21	Cup – bearing : 22	2
22	Hub	2
23	Cup – bearing : 22	2
24	Cone – bearing : 21	2
25	Pin : 49	2
26	Not Applicable	2
27	Not Applicable	
28	Annulus	
29	Pin : 31 (10 mm. O/D)	2
30	Pin : 31 (6 mm. O/D)	6
31	Carrier – planet	6
32	Plate – retaining	2
33	Button – thrust	2
34	Plug : 31 (1/8" B.S.P.T.)	2
35	Pin : 40	2
36	'O'-ring : 35	6
37	Capscrew : 31	6
38	Washer – spring : 37	18
39	Washer – side : 40	18
40	Gear – planet	6
41	Spacer : 42	6
42	Roller – needle : 40	6
43	Bush : 40	240
44	Pin – retaining : 35	12
45	Stud – wheel	6
46	Nut – wheel	12
47	Setscrew : 28	12
48	Shim pack	6
49	Spacer	2
50	Pin – brake	2
51	Circlip : 50	2
52	Rod – pull	2
53	Screw – bleed	2
54	Seal – internal : 56	2
55	Seal – external : 61	2
		2

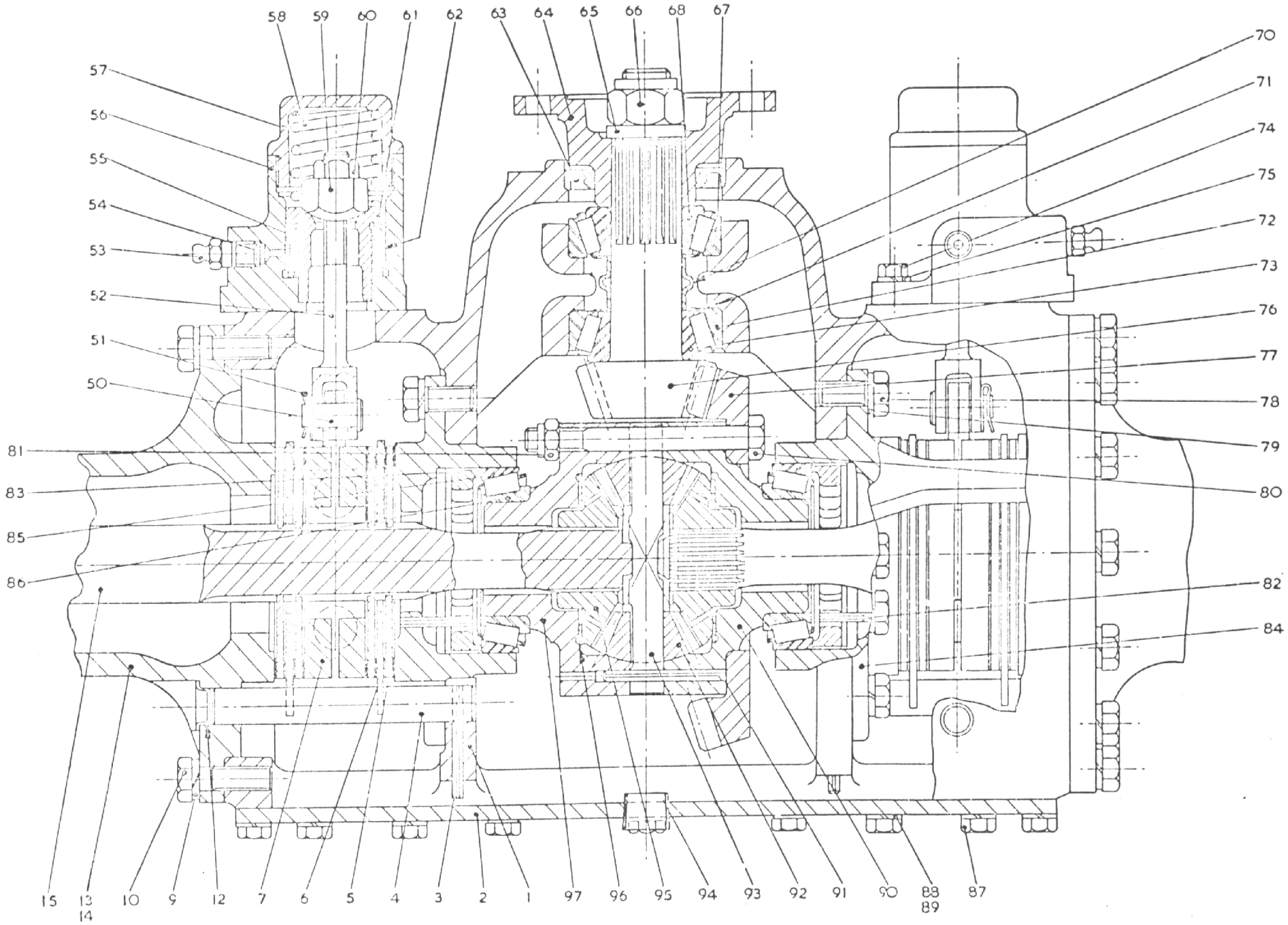
Item No.	Description	Qty.
56	Cylinder	2
57	Cap – end : 56	2
58	Spring : 56	2
59	Nut : 52	2
60	Nut – lock : 59	2
61	Piston	2
62	Spacer : 54 : 53	2
63	Seal – oil : 64	1
64	Flange – coupling	1
65	Washer : 66	1
66	Nut : 76	1
67	Cup – bearing	1
68	Cone – bearing	1
69	Shim : 70 .05 mm. (.002 in)	As Req'd
69	Shim : 70 .08 mm. (.003 in.)	As Req'd
69	Shim : 70 .13 mm. (.005 in.)	As Req'd
70	Spacer : 68/73	1
71	Shim : 76 .05 mm. (.002 in.)	As Req'd
71	Shim : 76 .13 mm. (.005 in.)	As Req'd
71	Shim : 76 .25 mm. (.010 in.)	As Req'd
72	Cup – bearing	1
73	Cone – bearing	1
74	Setscrew : 56	4
75	Washer – spring : 74	4
76	Pinion – spiral bevel	1
77	Wheel – spiral bevel	1
78	Setscrew : 84	16
79	Washer – spring : 74	16
80	Bolt : 90 : 97	8
81	Nut : 80	8
82	Pin – roll	4
83	Nut – adjusting : 85 : 86	2
84	Housing : 85 : 86	2
85	Cup – bearing : 86	2
86	Cone – bearing : 89 : 95	2
87	Setscrew : 2	16
88	Washer – spring : 87	9
89	Washer : 87	7
90	Cage – differential recessed	1
91	Pin – roll : 91	1
92	Pinion	2 or 4
93	Trunnion – spider	1
94	Plug – level	1
95	Wheel	2
96	Washer – thrust : 95	2
97	Cage – differential (bossed)	1
98	Dowel : 28	6
99	Dowel : 31	6

Items Not Shown

Plug – ½ in. B.S.P.T.	1
Plug – magnetic drain	1
Breather	1



SECTIONAL ARRANGEMENT OF HUB



SECTIONAL ARRANGEMENT OF AXLE CENTRE HOUSING

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